Mesoscale Kinetic Simulations of Proton Anisotropies in the Outer Magnetosphere

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Recent studies suggest that wave-])artic.lc scattering by the proton cyclotron anisotropy instability imposes an upper bound on the proton temperature anisotropy in the magnetosheath and the hot proton temperature anisotropy in the outer magnetosphere. 'J'] iese upper bound relations, which are commensurate with that predicted by the linear theory, represent potential limited closure relations for global scale MHD models of space plasma. However, if these upper bound relations are to prove useful in a]nac.rose.epic fluid model, they must be examined for its robustness in the presence of plasma and field gradients and nonlocal effects. In this study, we carry out mesoscale simulations of proton anisotropies using a two-dimensional hybrid PIC code. We study the proton cyclotron anisotropy instability in an inhomogeneous plasma and examine its effects on the anisotropy upper bound. Due to the computational intensive nature of mesoscale kinetic simulations, the simulations are performed on a 256-node Cray T3D parallel supercomputer.